

October 11, 2005

VIA HAND DELIVERY

Ms. Mary L. Cottrell, Secretary
Department of Telecommunications and Energy
One South Station, 2nd floor
Boston, MA 02110

Re: Investigation by the Department Regarding Service Quality Guidelines Established in Service Quality

Standards for Electric Distribution Companies and Local

Gas Distribution Companies, D.T.E. 04-116

Dear Secretary Cottrell:

Enclosed for filing on behalf of Fitchburg Gas and Electric Light Company d/b/a Unitil ("Unitil"), please find an original and one (1) copy of Unitil's responses to the Department's sixth set of information requests to all Electric Local Distribution Companies in the above-referenced docket. As requested, copies of Unitil's responses are being sent by e-mail to the parties.

Thank you for your attention to this matter.

Sincerely,

Cong Epler (P.M.B)
Gary Epler

Enclosure

cc: Jody M. Stiefel, Hearing Officer

Department's Sixth Set of Document and Information Requests

Request No. DTE-LDC 6-1

As an alternative to mandatory inspection and maintenance guidelines, please identify new Service Quality performance measures to realize the effective maintenance of your system?

Response:

Unitil believes that the results of inspection and maintenance policies and procedures are measurable in existing Service Quality guidelines. Proper inspection and maintenance policies and procedures result in reliable service to customers. The current Service Quality guidelines require reporting of reliability data by each electric and gas distribution company.

In addition to reliability measurements, customer satisfaction measurements reflect the quality of gas and distribution systems as perceived by the customers of each utility company.

Unitil does not believe that further Service Quality measures need to be instituted to realize the effective maintenance of electric and gas distribution systems.

Person Responsible: Christopher Dube & Christopher Leblanc

Date: October 11, 2005

Department's Sixth Set of Document and Information Requests

Request No. DTE-LDC 6-2

Using the Company's available historical outage information, please provide, in an active excel spreadsheet, a calculated required minimum number of customers affected to qualify for exclusion under IEEE-1366, med and the associated values of " (Alpha), \$ (Beta), T , SAIDI, and total customer minute interruption for the years 2000, 2001, 2002, 2003, and 2004, for each of the following assumed interruption durations: 1minute, 5 minutes, 60 minutes, 360 minutes, 720 minutes, 1,440 minutes and 2,880 minutes.

Response:

See Attachment DTE LDC 6-2.

Person Responsible: Kevin Sprague Date: October 11, 2005

Commonwealth of Massachusetts

Department of Telecommunications and Energy

Fitchburg Gas and Electric Light Company d/b/a Unitil Docket No: D.T.E. 04-116

Department Staff's First Set of Document and Information Requests

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Year	2000	2001	2002	2003	2004
Average # of Customers Served	26,138	26,138	26,295	26,189	26,569
Alpha	-2.15	-2.23	-2.37	-2.35	-2.36
Beta	2.25	2.26	2.24	2.27	2.29
Tmed	32.33	30.76	25.21	27.59	28.82
Customer Hours for MEDs	83347.90	00.00	12702.72	23447.97	20817.98
SAIDI (IEEE 1366 exclusions)	134.12	155.67	210.56	153.06	190.82
Total Customer Hours of Interruption (IEEE 1366 Exclusions)	58,425.10	67,813.00	92,277.70	66,806.62	84,500.08
Min # Customers Affected for MED Exclusion					
	845,139	804,130	662,978	722,532	765,637
9	169,028	160,826	132,596	144,506	153,127
09	14,086	13,402	11,050	12,042	12,761
360	2,348	2,234	1,842	2,007	2,127
720	1,174	1,117	921	1,004	1,063
1440	282	228	460	502	532
2880	293	279	230	251	266

Department's Sixth Set of Document and Information Requests

Request No. DTE-LDC 6-3

Regarding line loss, each electric company indicated that line loss was equal to the difference between energy requirement and energy sold, and that the loss includes various components such as actual system loss, theft, etc. Please list all the various components that your Company includes in reporting line loss, and briefly describe why each component is included in the line loss.

Response:

Included as part of Unitil's electric line loss figure are Company use, system losses, and voltage discounts made to certain general service accounts' metered data in accordance with the Company's tariff.

Company use is included in the line loss because Unitil does not record its Fitchburg facility's sales in its energy sold amount. Company usage also includes items such as substation equipment and line equipment.

Unitil does not have metering in place that measures system losses. System losses include transformer load and no load losses, conductor losses, meter losses, and theft.

Voltage discounts are included in the electric line loss figure. This accounts for transformer losses associated with customer owned equipment.

Person Responsible: Kevin Sprague Date: October 11, 2005

Department's Sixth Set of Document and Information Requests

Request No. DTE-LDC 6-4

Regarding line loss, please describe:

- (a) how the distribution and transmission loss factors that are reported to ISO-NE for the load settlement process are determined, include all supporting documents and a copy of the most recently reported loss factors for each voltage level;
- (b) how often the distribution and transmission loss factors reported to ISO-NE are updated;
- (c) what steps the Company currently takes to reduce its loss factors, and what steps the Company plans to take in the future to reduce its loss factors;
- (d) how the Company benefits, if at all, from reducing its loss factors;
- (e) what steps the Department could take to reduce loss factors;
- (f) for what purposes, other than load settlement, the Company uses its loss factors, describe each purpose and provide any supporting documents.

Response:

- (a) Loss factors that are included in the hourly loads reported to ISO-NE for the load settlement process are determined by conducting a system loss study. A copy of Unitil's last loss study from D.P.U. 90-122 is attached as Attachment DTE-LDC 6-4 (a).
- (b) Loss factors that are included in the hourly loads reported to ISO-NE for the load settlement process would normally be updated in a general rate case, or more frequent, if warranted. However, the last time Unitil conducted a loss study was in 1989 for docket D.P.U. 90-122.
- (c) Unitil takes several steps to manage system losses. These steps include evaluating losses on power transformers, service transformer specifications, and reactive VAR support.
 - When Unitil purchases power transformers that are used in substation applications, part of the specification details the loss factors used in the

Department's Sixth Set of Document and Information Requests

evaluation of the transformer. These loss factors are updated as needed and used to evaluate the total owning cost of various transformer quotes prior to accepting one of the bids.

For distribution service transformers, Unitil has adopted the NEMA TP 1 Guide for Determining Energy Efficiency for Distribution Transformers in all transformer specifications. Units that do not meet this efficiency standard will not be purchased.

Unitil evaluates changes in line loss as one of the factors in the economic analysis when evaluating multiple alternatives. Line loss is not generally the determining factor, though it may have an effect on the final decision. Unitil provides the Department with a copy of its Economic Evaluation Procedures as an attachment to the annual 01-67 filing. See Attachment 6 of Unitil's 01-67 Annual Report 2004, dated January 2005.

Losses through power transformers can be rather substantial during peak loading periods. Unitil actively manages the reactive requirements throughout the system in an attempt to reduce the losses through substation power transformers.

Unitil plans to continue these practices to actively manage system losses.

- (d) It is Unitil's goal to operate and maintain an efficient distribution system. One aspect of an efficient distribution system is losses. Lower system losses results in a lower cost per kwh for all customers. Decreasing system losses, in specific areas, may also result in decreasing voltage drop.
- (e) Unitil actively manages system losses during the planning processes. It is not apparent to Unitil how the Department could reduce loss factors.
- (f) In addition to the response in part (c) of this response, loss factors are used to adjust billing determinants in a rate case to get loss adjusted figures. Also, distribution losses are considered in the computation of class average load profiles to adjust meter point data to system level data.

Person Responsible: Kevin Sprague Date: October 11, 2005



EXHIBIT IX LOSS STUDY

Loss Calculations

The loss factors used in this study are summarized on the following pages. There are two portions of this study, the embedded losses and the marginal losses. The first three pages summarize the class loss factors by three time periods, on peak hours, off peak hours and all hours. On these pages, the MWh sales are the booked sales, the MWh loss is taken from schedule is, and the reallocation of transformer losses takes into account the 3% loss associated with transformer loss on customer premises. The loss factors are calculated for the following customer classes and their associated voltage levels and are summarized as follows:

Class	On Peak Loss	Off Peak Loss	Average Loss
D1 /D4			
R1/R4	9. 23%	6.01%	7. 52%
R2	9. 23%	6.01%	7.52%
G1	9. 23%	6.01%	7.89%
G2/G4/G5	9. 09%	5.77%	7.72%
G 3	5. 40%	3.40%	4. 45%
OL	9. 23%	6.01%	6.71%

These loss factors are applied to the sales to produce the loss adjusted kWh sales for each class.

The accompanying schedules and workpapers are numbered as follows and are included in both the embedded and marginal sections of the study:

Schedule 1A	Summary of MWH Losses
Schedule 1B	Summary of HW Losses on Peak
Schedule 2A	Average Annual Losses
Schedules 2B	Average On Peak and Off Peak Losses
Schedule 3	Peak Hour Losses
Workpaper 1	Load and Load Flow Data
Workpaper 2A	Substation Load Information
Workpaper 2B	Distribution Transformer Load Information
Workpaper 2C	Transformer Load and Line Loss Information

FITCHBURG GAS AND ELECTRIC LIGHT COMPANY ALLOCATED ENERGY LOSS FACTORS ALL HOURS TEST YEAR 1989

							+
TOTAL MAH SALES		372,753.9 M					
	•	TOTAL MIN SALES	MMH LOSS T	REALLOCATION OF RANSFORMER LOSS (1)	≭ OF LOSS TO SALES :	CUMULATIVE C OF LOSS TO SALES	
TRANSMISSION SUB-TRANSMISSION PRIMARY SECONDARY		372, 754 372, 754 316, 338 258, 837	1, 155 1, 720 14, 524 6, 964	1, 155 3, 413 15, 949 3, 846	0.31% 0.92% 5.04% 1.43%	0.31x 1.23x 6.27x 7.70x	
			24, 363	24, 363			
					•	R	1/R4/R2/G1/S1
RESIDENTIAL / STREE	T LIGHTING LOSS I	FACTOR:					7.70
WEIGHTED LOSS FACTO	ors by class test	YEAR 89:					
INDUSTRIAL / 8-3 SLB-TRANS (2)	A	CTUAL MAH SALES 56,416	WT 44.37%	CLM LOSS \$ 1.23%	WTD LOSS 0.54%		ı
PRIMARY (3)		33, 554	26.39%	6.27%	1.65%	•	
			29.24%	7.70%	2.25%		
SECONDARY		37, 178	EJ. 27A	1.104	-1		
Secondary Total		37, 178 127, 148	100%		4.45%	•	
						•	63
	12 3 3 3 8 2 2 3 3 2 3 3 2 8 3 2					-	63 4.45
		127, 148				- 	
TOTAL	AC		x001	un loss x	4.45%	- 	
TOTAL COMMERCIAL / 6-2	9.	127, 148	100x		4. 45%		
COMMERCIAL / 6-2 PRIMARY (3)	A(127, 148 CTUAL MAH SALES 13, 947	100x WT CX 12.997;	UN LOSS \$ 6.27\$	4.45x WTD LOSS 0.81x		
TOTAL COMMERCIAL / 6-2 PRIMARY (3) SECONDARY	A(127, 148 CTUAL MAN SALES 13, 947 93, 365	100x WT C1 12.997x 87.003x	UN LOSS \$ 6.27\$	4.45% WTD LOSS 0.81% 6.70%		
COMMERCIAL / G-2 PRIMARY (3) SECONDARY TOTAL		127, 148 CTUAL MAH SALES 13, 947 93, 365	100x WT C1 12.997x 87.003x	UN LOSS \$ 6.27\$	4.45% WTD LOSS 0.81% 6.70%	• •	4.45
TOTAL COMMERCIAL / 6-2 PRIMARY (3) SECONDARY		127, 148 CTUAL MAN SALES 13, 947 93, 365	100x WT C1 12.997x 87.003x	UN LOSS \$ 6.27\$	4.45% WTD LOSS 0.81% 6.70%		4.45 62 7.51:
COMMERCIAL / G-2 PRIMARY (3) SECONDARY TOTAL	 	127, 148 CTUAL MAH SALES 13, 947 93, 365 107, 313	100x WT CL 12.997x 87.003x 100x	# LOSS \$ 6.27\$ 7.70\$	4.45x WTD LOSS 0.81x 6.70x 7.51x	G-3 127, 148, 252	4. 45 62 7. 51:
TOTAL COMMERCIAL / G-2 PRIMARY (3) SECONDARY TOTAL KMH SALES * LOSS ADJUSTMENT	TOTAL.	127, 148 CTUAL MAH SALES 13, 947 93, 365 107, 313 R-1, R-4	100x WT C1 12.997x 87.003x 100x	## LOSS * 6.27* 7.70*	4.45x WTD LOSS 0.81x 6.70x 7.51x		4.45 62 7.51: 9-1 3,053,913
TOTAL COMMERCIAL / 6-2 PRIMARY (3) SECONDARY TOTAL KMH SALES	TOTAL.	127, 148 CTUAL MAH SALES 13, 947 93, 365 107, 313 R-1, R-4 123, 702, 301	100x WT Ct 12.997x 87.003x 100x R-2 7,807,614	G-1 3,729,277	4.45x MTD LOSS 0.81x 6.70x 7.51x 6-2 107,312,543	127, 148, 252	4. 45 62 7. 51:

SUMPTIONS: (1) ADJUSTED BY 3% OF MAH SALES AT SUBTRANSMISSION(2) AND PRIMARY(3), TO REFLECT TRANSFORMER LOSSES ON CUSTOMER PREMISES.

NOTES: SUM OF ON/OFF PEAK ADJUSTED FOR CLASS ON/OFF PEAK DIVERSITY MAH LOSS DATA AT AVERAGE LOAD LEVEL FROM LOSS STUDY ADJUSTED FOR 1989 (SCHEDULE 1A, SECTION 1).

FITCHBURG GAS AND ELECTRIC LIGHT COMPANY ALLOCATED ENERGY LOSS FACTORS ON-PEAK TEST YEAR 1989

IUIAL MAN SALES MAN LOSS TRANSFORMER LOSS TO SALES x OF LOSS x	XX FS					196, 166 M		
196, 166 612 612 6.31		CUMULATIVE OF LOSS TO SALES		REALLOCATION OF TRANSFORMER LOSS	MAH LOSS	TOTAL NAH SALES		
RESIDENTIAL / STREET LIGHTING LOSS FACTOR: MEIGHTED LOSS FACTORS BY CLASS TEST YEAR 89: INDUSTRIAL / 6-3 ACTUAL MAIN SALES MT	31% 22% 17%	0.31% 1.22% 8.17% 9.23%	0.31% 0.91% 6.96%	612 1,778 11,523 1,468	863 10, 734 3, 172	196, 166 196, 166 165, 670 139, 358		SUB-TRANSMISSION PRIMARY
NEIGHTED LOSS FACTORS BY CLASS TEST YEAR 89: INDUSTRIAL	R1/R4/R2/G1/S1	n		10g 30C	20j DOL			
INDUSTRIAL	9.2.	r				FACTOR:	T LIGHTING LOSS	RESIDENTIAL / STREET
SUB-TRANS (2) ACTUAL MAN SALES 30,495 44.37% 1.22% 0.54% PRIMARY (3) 18,137 26.39% 8.17% 2.16% SECONDARY 20,097 29.24% 9.23% 2.70% TOTAL 68,729 ACTUAL MAN SALES AT CUN LOSS % WITD LOSS 5.40% TOTAL COMMERCIAL / 6-2 PRIMARY (3) ACTUAL MAN SALES 8,175 12.997% 8.17% 1.06% SECONDARY 54,722 87.003% 9.23% 8.03% TOTAL TOTAL R-1,R-4 R-2 6-1 6-2 6-3						IT YEAR 89:	irs by Class tes	HEIGHTED LOSS FACTO
PRIMARY (3) 18,137 26.39% 8.17% 2.16% SECONDARY 20,097 29.24% 9.23% 2.70% TOTAL 68,729 100% 5.40% COMMERCIAL / 6-2 PRIMARY (3) ACTUAL MAH SALES MT CUM LOSS % MTD LOSS SECONDARY 12.997% 8.17% 11.06% SECONDARY 54,722 87.003% 9.23% 8.03% TOTAL 62,896 100% 9.09% TOTAL R-1,R-4 R-2 6-1 6-2 6-3								INDUSTRIAL / 6-3
SECONDARY 20,097 29.24x 9.23x 2.70x TOTAL 68,729 100x 5.40x COMMERCIAL / 6-2 PRIMARY (3) ACTUAL MAN SALES 8,175 12.997x 8.17x 1.06x SECONDARY TOTAL 62,896 100x TOTAL 7000 TOTAL R-1,R-4 R-2 6-1 6-2 6-3						30, 495		•
TOTAL R-1, R-4 R-2 G-1 G-2 G-3 **EU, 937			2.16x	8. 17%	26.39%	·		
COMMERCIAL / 6-2 PRIMARY (3) ACTUAL MAH SALES 8,175 12.997% 8.17% 1.06% SECONDARY 54,722 87.003% 9.23% 8.03% TUTAL TUTAL R-1,R-4 R-2 6-1 6-2 6-3			2.70%	9.23%	29.24%			
PRIMARY (3) ACTUAL MMH SALES 8, 175 12. 997x 8. 17x 1. 06x SECONDARY. 54, 722 87. 003x 9. 23x 8. 03x TUTAL TOTAL R-1, R-4 R-2 6-1 6-2 6-3	03		5.40%		100%	68, 729		TOTAL .
PRIMARY (3) ACTUAL MMH SALES 8, 175 12. 997x 8. 17x 1. 06x SECONDARY. 54, 722 87. 003x 9. 23x 8. 03x TUTAL TOTAL R-1, R-4 R-2 6-1 6-2 6-3	63							
PRIMARY (3) ACTUAL MMH SALES 8,175 12.997x 8.17x 1.06x 54,722 87.003x 9.23x 8.03x TUTAL TOTAL R-1,R-4 R-2 6-1 6-2 6-3	5. 40				22522222222222222222222222222222222222	********	***********	*************
8,175 12.997% 8.17% 1.06% SECONDARY. 54,722 87.003% 9.23% 8.03% TOTAL 8-1,8-4 8-2 6-1 6-2 6-3								COMMERCIAL / 6-2
TOTAL R-1, R-4 R-2 G-1 G-2 G-3							I	
TOTAL R-1, R-4 R-2 G-1 G-2 G-3	• .	• .	8. 03x	9.23%	87.003x	54,722		
TOTAL R-1, R-4 R-2 G-1 G-2 G-3			9.09%		100%	62, 896		TUTAL
TOTAL R-1, R-4 R-2 G-1 G-2 G-3	62							
TOTAL R-1, R-4 R-2 G-1 G-2 G-3	9.09							\$22 422222222
KIN GOLEG ADV ACT TAN CO. T	S-1							
3,662,531 2,185,738 62,896,144 68,729		68, 729, 369	62, 896, 144	2, 185, 738	3,662,531	56, 028, 423	196, 165, 700	KIH SALES
* LOSS ADJUSTMENT 9.23% 9.23% 9.23% 9.09% 5	•	5.40x		•	9.23%	9. 23%		
LOSS ADJUSTMENT 15, 382, 074 5, 354, 729 337, 970 201, 695 5, 717, 785 3, 708,	0 61,226	3,708,670	5,717,785	201,695	337, 970	5, 354, 729	15, 382, 074	LOSS ADJUSTMENT
KIH SALES 211.547.774 63 383 152 4 400 mg.	** **********	72, 438, 039	68, 613, 929	2, 387, 433	4,000,501	63, 383, 152	211,547,774	Kiih sales (Loss adjusted)

^{**}SUMPTIONS: (1) ADJUSTED BY 3% OF MMH SALES AT SUBTRANSMISSION(2) AND PRIMARY(3), TO REFLECT TRANSFORMER LOSSES ON CUSTOMER PREMISES.

* MMH LOSS DATA AT ON-PEAK LOAD LEVEL FROM 1986 LOSS STUDY ADJUSTED FOR 1989 (SCHEDULE 1A, SECTION I).

FITCHBURG GAS AND ELECTRIC LIGHT COMPANY ALLOCATED ENERGY LOSS FACTORS OFF-PEAK TEST YEAR 1989

TOTAL MIN SALES		176,588 M	H				
		TOTAL MAN SALES	MH LOSS	REALLOCATION OF TRANSFORMER LOSS (1)	≭ OF LOSS TO SALES ★	CUMULATIVE OF LOSS TO SALES	
Transmission Sub-transmission Primary Secondary		176, 568 176, 588 150, 668 129, 478	542 857 3, 790 3, 791 8, 981	542 1,635 4,426 2,378 8,981	0.31% 0.93% 2.94% 1.84%	0.31x 1.23x 4.17x 6.01x	
						F	1/R4/R2/61/S1
RESIDENTIAL / STREE	T LIGHTING LOSS	FACTOR:					6.0
HEIGHTED LOSS FACTO	rs by class tes	IT YEAR 891	•				
INDUSTRIAL / 6-3		actual man sales	187	M MA A A A A B B B B			
SUB-TRANS (2)		25, 921	¥1.37≴	CUM LOSS x 1.23%	WTD Loss 0.55%		
PRIMARY (3)		15,417	26.39x	4-17#	1.10%		
SECONDARY		17,082	29.24%	6.01%	1.76%		
TOTAL		58, 419	100%		3.40%		
							63 3.40
				-	************	2446242222222222	
PRIMARY (3)	1	ACTUAL MAH SALES 5,773	WT C 12.997≴	UM LOSS % 4.17%	WTD LOSS 0.54%		
SECONDARY		38, 644	87.003×	6.01%	5.23%	•	
TOTAL		44,416	100%		5.77%		
							62 5.77
************	**********		332232222222222				J. / /
•	TOTAL	R-1, R-4	R-2	6-1	6-2	G-3	C 4
KMH SALES	176, 588, 200	65, 673, 878	4, 145, 083	1,543,539	44, 416, 399	58, 418, 883	S-1
* Loss adjustment		6.01%	6.01%	6.01%	5.77%	3.40x	2,390,418
LOSS ADJUSTMENT	8, 980, 939	3, 945, 012	248, 994	92,720	2, 562, 053	1, 988, 569	6.01; 143,592
KMH SALES (LOSS ADJUSTED)	185, 569, 139	69, 618, 890	4,394,077	1,636,259	46, 978, 452	60, 407, 452	**************************************

⁻⁻ SSUMPTIONS: (1) ADJUSTED BY 3% OF MMH SALES AT SUBTRANSMISSION(2) AND PRIMARY(3), TO REFLECT TRANSFORMER LOSSES ON CUSTOMER PREMISES.

* MMH LOSS DATA AT OFF-PEAK LOAD LEVEL FROM 1986 LOSS STUDY ADJUSTED FOR 1989 (SCHEDULE 1A, SECTION 1).

Embedded Loss Study

I. AVERAGE LOAD LEVEL (47.76 MW)

	LINE	CORE	COIL	TOTAL MAH	CUMULATIVE Muh
TRANSMISSION	1, 155			1,155	1, 155
SUBTRANSMISSION	324	894	502	1,720	2,875
PRIMARY	12, 459	1,288	778	14,524	17, 399
SECONDARY	256	5, 935	773	6, 964	24, 363

II. ON PEAK LOAD LEVEL (72.7 MM)

	LINE	CORE	COIL	TOTAL Mili	CUMULATIVE MAH
TRANSMISSION	612	-		612	612
SUBTRANSMISSION	172	383	309	863	1, 476
PRIMARY	9,705	551	478	10,734	12,210
SECONDARY	157	2,541	475	3, 172	15, 382

III. OFF PEAK LOAD LEVEL (48.25 MH)

	LINE	CORE	COIL	TOTAL MAH	CUMULATIVE MAH
TRANSMISSION	542	amphops		542	542
SUBTRANSMISSION	152	511	194	857	1,399
PRIMARY	2,754	736	300	3, 790	5, 190
SECONDARY	99	3, 395	298	3, 791	8, 981

SCHEDULE 1B

I. AT PEAK LOAD LEVEL (72.7 MI)

	LINE	CORE	COIL	TOTAL MW	CUMULATIVE MW
TRANSMISSION	0.2960	easted:		0.2960	0.2960
SUBTRANSMISSION	0.1003	0.1020	0.1329	0.3352	0.6311
PRIMARY	7.0378	0.1470	0.2058	7.3906	8.0217
SECONDARY	0.0734	0.6776	0.2044	0.9554	8. 9771

AVERAGE ANNUAL LOSSES

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HOURS IN PERIOD 8760
```

I. TRANSMISSION

```
A. LINE LOSSES = PROFORMED LINE LOSSES FROM LOADFLOM * HOURS PER PERIOD = (89 PERK/ 81 OFF PERK * ANNUAL LOAD FACTOR)^2 * OFF PERK LINE LOSSES * HOURS PER PERIOD = 1.0008 * 0.1317 * 8760 = 0.1318 * 8760 = 1,155 MMH
```

B. TRANSFORMER LOSSES

CORE = NONE

COIL = NONE

II. SUBTRANSMISSION

```
A. LINE LOSSES = PROFORMED LINE LOSSES FROM LOADFLOW # HOURS PER PERIOD = (89 PERK/ 81 OFF PERK # ANNUAL LOAD FACTOR)^2 # OFF PERK LINE LOSSES # HOURS PER PERIOD = 0.0370 # 8760 = 0.0370 # 8760 = 324 MMH
```

B. TRANSFORMER LOSSES

```
CORE = NAMEPLATE RATING # WESTINGHOUSE LOSS FACTOR (MP-2B) # HRS IN PERIOD = 51.000 # 0.002 # 8760 = 0.1020 # 8760 = 894 MMH
```

COIL = (RATIO OF PEAK TO NOMEPLATE #LORD FACTOR)^2 = NOMEPLATE RATING = LOSS FACTOR * HRS IN PERIOD = (33.613 / 51.000 +0.656928)^2 * 51.000 * 0.006 * 8760 = 0.0574 * 8760 = 502 MMH

III. PRIMARY

B. TRANSFORMER LOSSES

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CORE = NAMEPLATE RATING # MESTINGHOUSE LOSS FACTOR (MP-2B) # HRS IN PERIOD = 73.500 # 0.002 # 8760 = 0.1470 # 8760 = 1288 MMH
```

COIL = (RATIO OF PEAK TO NAMEPLATE*LOAD FACTOR)^2 * NAMEPLATE RATING * LOSS FACTOR * HRS IN PERIOD = (50.204 / 73.500 *0.656928) ^2 * 73.500 * 0.006 * 8760 = 0.0888 * 8760 = 778 MMH

IV. SECONDARY

B. TRANSFORMER LOSSES

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CORE = CORE LOSS IN NN FROM WORKPAPER 2B + HOURS IN PERIOD = 0.6776 + 8760 = 5935 MMH
```

COIL = (RATIO OF PRIMARY PEAK TO NAMEPLATE*LOAD FACTOR)^2 * NAMEPLATE RATING * LOSS FACTOR * HRS IN PERIOD = (50.204 / 148.917 *0.656928) ^2 * 148.917 *0.012079 * 8760 = 0.0882 * 8760 = 773 Mah

V. DERIVATION OF PRIMARY AND SECONDARY LINE LOSSES

```
TOTAL ANNUAL LOSSES = 24363 MMH
TOTAL IDENTIFIED = 11649 MMH

REMAINING LOSSES = 12714 MMH

PRIMARY LINE LOSSES = PRIMARY LOSS FACTOR FROM WORKPAPER 2C * REMAINING LOSSES = 0.9799 # 12714 |
12459 MMH
```

SECONDARY LINE LOSSES = SECONDARY LOSS FACTOR FROM WORKPAPER 2C * REMAINING LOSSES = 0.0201 * 12714 = 256 MMH

HOURS IN

PERIOD 3750

TRANSMISSION

A. LINE LOSSES * PROFORMED LINE LOSSES FROM LOADFLOW * HOURS PER PERIOD

(89 PEAK/ 81 PEAK + ON PEAK LOAD FACTOR)^2 + ON PEAK LINE LOSSES + HOURS PER PERIOD -

0.7640 # 0.2565 # 0.1960 # 3750 = 3750 3

735 MMH

B. TRANSFORMER LOSSES

CORE NONE

=

COIL NONE

II. SUBTRANSMISSION

A. LINE LOSSES * PROFORMED LINE LOSSES FROM LOADFLOM * HOURS PER PERIOD

(89 PERK/ 81 ON PEAK + ON PEAK LOAD FACTOR)^2 + ON PEAK LINE LOSSES + HOURS PER PERIOD z

0.7640 # 0.0869 # 3750

0.0664 # 3750

249 MAH

B. TRANSFORMER LOSSES

CORE NAMEPLATE RATING + WESTINGHOUSE LOSS FACTOR (MP-28) + HRS IN PERIOD

51.000 + 0.002 # 3750

= 0.1020 # 3750

383 MM

(RATIO OF PK TO NAMEPLATE+ON PK LOAD FCTR)^2 + NAPLATE RATE + WEST LOSS FCTR + HRS IN PERIOD COIL =

=

33.613 / 51.000 +0.813692) ^2 + 51.000 + 0.006 + 0.006 + 3750

330 MAH

III. PRIMORY

B. TRANSFORMER LOSSES

=

2

=

CORE = NAMEPLATE RATINS + MESTINGHOUSE LOSS FACTOR (MP-28) + HRS IN PERIOD

73.500 + 0.002 # 3750

0.1470 + 3750

551 MAH

(RATIO OF PEAK TO NAMEPLATE*LOAD FACTOR)^2 * NAMEPLATE RATING * LOSS FACTOR * HRS IN PERIOD COIL =

50.204 / 73.500 +0.813692) ^2 + 73.500 + 0.006 + 0.1362 + 3750 = 3750

. 511 MM

IV. SECONDARY

B. TRANSFORMER LOSSES

CORE * CORE LOSS IN MN FROM WORKPAPER 28 * HOURS IN PERIOD

≖ 0.6776 # 3750

2541 Mill

= (RATIO OF PRIMARY PEAK TO NAMEPLATE+LOAD FACTOR)^2 * NAMEPLATE RATING * LOSS FACTOR * HRS IN PERIOD COIL

50.204 / 148.917 #0.813692) ^2 # 148.917 #0.012079 # 3750

0.1354 + * 3750

= 506 MAH

DERIVATION OF PRIMARY AND SECONDARY LINE LOSSES

PRIMARY LINE LOSSES = ADJUSTED PRIMARY ON-PEAK LOSS FROM WORKPAPER 2C

ON-PEAK 10658 MH

= ADJUSTED SECONDARY ON-PEAK LOSS FROM WORKPAPER 2C SECONDARY LINE LOSSES ON-PEAK

168 MAH

HOURS IN PERIOD 5010

I. TRANSMISSION

A. LINE LOSSES = PROFORMED LINE LOSSES FROM LOADFLOM * HOURS PER PERIOD = (89 OFF-PEAK PEAK * 81 OFF-PEAK PEAK * OFF PEAK LOAD FACTOR)^2 * OFF PEAK LINE LOSSES * HOURS PER PERIO = 0.8217 * 0.1317 * 5010

= 0.1082 + 5010 = 542 MH

B. TRANSFORMER LOSSES

CORE = NONE

COIL = NONE

II. SUBTRANSMISSION

A. LINE LOSSES = PROFORMED LINE LOSSES FROM LOADFLOM + HOURS PER PERIOD = (89 OFF-PEAK PEAK 81 OFF-PEAK PEAK + OFF PEAK LOAD FACTOR)^2 + OFF PEAK LINE LOSSES + HOURS PER PERIO = 0.8217 + 0.037 + 5010 = 0.0304 + 5010 = 152 MMH

B. TRANSFORMER LOSSES

CORE = NAMEPLATE RATING * WESTINGHOUSE LOSS FACTOR (MP-2B) * HRS IN PERIOD
= 51.000 * 0.002 * 5010
= 0.1020 * 5010
= 511 MMH

COIL = (RATIO OF PK TO NAMEPLATE+OFF PK LOAD FCTR)^2 + NAPLATE RATE + WEST LOSS FCTR + HRS IN PERIOD = (33.613 / 51.000 + 0.5396) ^2 + 51.000 + 0.006 + 5010 = 0.0387 + 5010 = 194 MeH

III. PRIMARY

B. TRANSFORMER LOSSES

CORE = NAMEPLATE RATING * WESTINGHOUSE LOSS FACTOR (WP-2B) * HRS IN PERIOD = 73.500 * 0.002 * 5010 = 0.1470 * 5010 = 736 MMH

COIL = (RATIO OF PEAK TO NAMEPLATE*LOAD FACTOR)^2 * NAMEPLATE RATING * LOSS FACTOR * HRS IN PERIOD = (50.204 / 73.500 * 0.5396)^2 * 73.500 * 0.006 * 5010 = 300 MMH

IV. SECONDARY

B. TRANSFORMER LOSSES

CORE = CORE LOSS IN NM FROM MORKPAPER 2B * HOURS IN PERIOD = 0.6776 * 5010 = 3395 MMH

COIL = (RATIO OF PRIMARY PEAK TO NAMEPLATE*LOAD FACTOR)^2 * NAMEPLATE RATING * LOSS FACTOR * HRS IN PERIOD = (50.204 / 148.917 * 0.5396) ^2 * 148.917 *0.012079 * 5010 = 0.0595 * 5010 = 298 MMH

V. DERIVATION OF PRIMARY AND SECONDARY LINE LOSSES

PRIMARY LINE LOSSES = ADJUSTED PRIMARY OFF-PEAK LOSS FROM WORKPAPER 2C

2754 MAH

SECONDARY LINE LOSSES = ADJUSTED SECONDARY OFF-PEAK LOSS FROM WORKPAPER 2C

OFF-PEAK = 99 MMH

I. TRANSMISSION

A. LINE LOSSES = PROFORMED LINE LOSSES FROM LOADFLOW * HOURS PER PERIOD = (89 PEAK/ 81 PEAK)^2 * ON PEAK LINE LOSSES = 1.1538 * 0.2565 = 0.2960 MW

B. TRANSFORMER LOSSES

CORE = NONE

COIL = NONE

II. SUBTRANSMISSION

A. LINE LOSSES = PROFORMED LINE LOSSES FROM LOADFLOW + HOURS PER PERIOD = (89 PERK / 81 PERK) ^2 + ON PERK LINE LOSSES = 1.1538 + 0.0869 = 0.1003 MM

B. TRANSFORMER LOSSES

CORE = NUMEPLATE RATING * HESTINGHOUSE LOSS FACTOR (MP-2B)
= 51.000 * 0.002
= 0.1020 MM

COIL = (RATIO OF PK TO NAMEPLATE)^2 * NAPLATE RATE * MEST LOSS FCTR (33.613 / 51.000) ^2 * 51.000 * 0.006

III. PRIMARY

B. TRANSFORMER LOSSES

CORE = NAMEPLATE RATING # WESTINGHOUSE LOSS FACTOR (MP-2B)

73.500 # 0.002

0.1470 MM

COIL = (RATIO OF PEAK TO NAMEPLATE)^2 * NAMEPLATE RATING * LOSS FACTOR = (50.204 / 73.500) ^2 * 73.500 * 0.006 = 0.2058 MM

IV. SECONDARY

B. TRANSFORMER LOSSES

CORE = CORE LOSS IN MM FROM MORKPAPER 28 # HOURS IN PERIOD = 0.6776 MM

COIL = (RATIO OF PRIMARY PEAK TO NAMEPLATE)^2 * NAMEPLATE RATING * LOSS FACTOR = (50.204 / 148.917) ^2 * 148.917 * 0.012079 = 0.2044 MM

V. DERIVATION OF PRIMARY AND SECONDARY LINE LOSSES

PRIMARY LINE LOSS = (AMPS * * LOAD ON PEAK)^2*MILES*CONDUCTORS*OHMS PER M FT*5.28 MFT PER MILE ON-PEAK = (230 * 0.40)^2 * 477.05 * 2 * 0.1635 * 5.28

SECONDARY SERVICES = (AMPS)^2*CHMS PER MFT*CUSTOMERS*DROP FT*CONDUCTORS
ON-PERK LOSSES = (6) ^ 2 * 0.4157 80 * 24288 * 2

= 0.0582 MM

========

FITCHBURG LOSS STUDY LOAD AND LOAD FLOW DATA

WORKPAPER 1

I. LOAD DATA

TEST YEAR PEAK LOAD (NW)	72.70
Test year man generated and purchased	418, 366
TEST YEAR MAN ACCOUNTED FOR	394,003
TEST YEAR UNACCOUNTED FOR MAH LOSSES	24, 363
TEST YEAR LOAD FACTOR: ((GEN & PUR)/8760/PEAK LOAD)	65 . 69%
TEST YEAR AVERAGE PEAK (MM): ((GEN & PUR)/8760 HRS PER YR)	47.76
TEST YEAR OFF PEAK LOAD (MI)	48.25
TEST YEAR OFF PEAK PERIOD LOAD FACTOR W/OFF PK LOAD	81.30%
TEST YEAR ON PEAK PERIOD LOAD FACTOR	81.37%
TEST YEAR OFF PEAK LOAD FACTOR WITH ON PEAK PK	53. 96×
II. LOAD FLOW DATA	
TRANSMISSION SYSTEM LINE LOSS 67.68 MM PEAK	0.2565 MW
SUBTRANSMISSION SYSTEM LINE LOSS 67.68 MM PEAK	0.0869 MH
TRANSMISSION SYSTEM LINE LOSS 47.74 MM PEAK	0.1317 MH
SUBTRANSMISSION SYSTEM LINE LOSS 47.74 MM PEAK	0.0370 MH

FITCHBURG LOSS STUDY SUBSTRATION LOADING INFORMATION

I. DERIVATION OF COINCIDENT LOADING FACTOR

PEAK (IM) 72.700 NVA 0 .95% POMER FACTOR 76.526

KNOWN COINCIDENT LOADS:

FLAGG POND #2 FDR

3.74 MM/.8 PF 4.68 TUTAL KNOWN 20.76

COINCIDENT LOAD MYA FOR THE REST OF THE SYSTEM #

SUBSTATIONS:	NONCOINCIDENT NVA	COINCIDENT NVA (NONCOIN+. 9165)	NAMEPLATE MVA
P CANTON 4 KV P CANTON 13 KV P ELLIS ST P ELEC STATION # P LIN 4 KV P MOCKEE 4 KV * P PLEASANT 13 KV P RINGE 4 KV P RIVER 13 KV P SOL FITCH 4KV # P TOWNSEND 13 KV P MALLACE 4 KV P H. FITCH P W. FITCH P W. TOWNSEND #39 FDR #36 FDR #40 FDR BEECH ST	2.544 2.736 2.184 4.800 4.080 2.995 0.996 6.144 i.152 8.550 i.411 6.432 1.930 0.922 3.328 5.200 2.860 2.400 2.500	2. 629 2. 828 2. 257 4. 961 4. 217 3. 095 1. 029 6. 350 1. 191 8. 837 1. 458 6. 648 1. 995 0. 953 3. 440 5. 374 2. 956 2. 480 2. 584	2.500 10.000 2.500 3.750 5.000 2.500 10.000 1.500 2.500 7.500 3.750 3.750 7.500
TOTAL NON COINCIDENT LOAD LESS+(+ INCLLIDED ELSEWHERE	63.164 MVA 53.958 MVA	65.281 NVA 55.766 NVA	
TOTAL PRIMARY LOAD (P)	50.204 MVA	•	73.500 NVA

COINCIDENT LOADING FACTOR = COINCIDENT LOAD OF REST OF THE SYSTEM / NONCOINCIDENT LOAD = 55.766 / 53.958 = 1.0335

FITCHBURG LOSS STUDY DISTRIBUTION TRANSFORMER LOADING INFORMATION

KWA 1.5 2.5 3 5 7.5 9 10 15 25 30 37.5 45 50 75 100	977 28 1 16 505 2 14 1216 808 1400 51 191 47 229 81 53	SUBTOTAL 42 2.5 48 2525 15 126 12160 12120 35000 1530 7162.5 2115 11450 5075 5300 1456					COIL LOSS 10-45 KVA: 72846 /	· 148917 = 0.0148	KW/KVA = 0.007239 KW.
-	4655	97127	KVA	* 0.00537	KW/KVA =	521.57			
150 150 167 200 225 250 300 333 500 750	18 6 13 3 4 4 33 3 21	2700 900 2171 600 900 1000 9900 999 10500 3000					CDIL LOSS 50-500 KVA: 53951 /	148917 + 0.0103	KW/KVA = 0.003731 KW.
	109	32670	KVA	# 0.00317	KW/KVA =	103.56			
1000 1500 2500	3 1 1	3000 1500 2500							•
,	5	7000	_	* 0.002	KW/KVA =	14.00	COIL LOSS		•
GRAND TOTAL	4769	136797	KVA				750 + KVA		
CLISTONER CHINED SECONDARY HETERED		12120		* 0.00317	KW/KVA =	38.42	22120 /	148917 = 0.00746	KW/KVA = 0.001108 KW/
		148917	KVA	TOTAL CORE	LOSS =	677.56		COMPOSITE COIL	LOSS = 0.012079 KW/

	LOGS STURY) FINGE, M. F. TTO-10 F.DR.)			T PER KILE + MAS IN PERIOD + 6760	STEO HIS IN PERIOD	20 NFT PER NILE + MS IN PERICO + 5010	+ 2 + 6760	+ 2 + 3750	. 2 4 5010	RSGURE 2 SPARS, 2 CLISTOWERS BLCN WITH TAX COUNCIDENCE FACTOR * (2404PS-ACTION, FACTOR-LIND FACTOR)-FANNS FOLES-1973 FOLES-2-23-14, 44 NFT-, 10.55 DAKS PER NFT+19, 724NFT + ,1644 DAN PER NFT + SCHOOL FACTOR + NR IN PER * 0.00577 + 8760 * 0.00577 + 8760 * 38 NAH	ASSUME 2 SPANS, 2 CUSTOMERS BICH WITH TAX C.F. = (2-AMPSACOTINE, FRETCHLORD FACTON-2-1906 POLES-2/3-14, 44 HFT4, 1025 CHHS PER MFT4!9, 724MFT + ,1644 CHM PER MFT + 9CNLE FRETCH + HR IN PER = 10,0005 + 3750 = 0.0005 + 3750 = 0.0005 + 3750 = 0.0005 + 3750	RSSME 2 SPING. 2 DISTURENB BOCK WITH TOK C.F. = (2-OMPS-COUNC. FACTON-LOOD FACTON-2-1986 POLES-1973 POLES-2/3-14, th MFT-, 10X5 GHS PER MFT+19, 724MFT + , 1644 GH PER MFT + SCALE FACTOR + MR IN PER = 0.035289) ^ 2 + 15637 / 14464 NP /3 + (4,737165 + 54,3873 + 5010 = 0.04435 + 5010 = 22 MAH		KE LOSSES	INE LUSSES		1.05553	
RETING AT PESK LOOD		51.000 NAS 32.613 NAS		ILES-CONDUCTURS-DANS PERN FT-65,20 NF 15 * 2 * 0,1635 * 5,28	POLILES CONDICTORS - OPEN FP.5.2 IS + 2 + 0.15.33 + 5.28	*244ULESACIMULTURSACH8 PER M FT45. G * 2 * 0.1633 * 5.23	NOP FT-CONGLICTURS-HR IN PER 7 + 80 + 24286	24288	NOP FT-CONDUCTORS-HR IN PER F + 80 + 24286 +	IDDUE FACTOR 1973 POLESIE2341, 44 NFTs, 1035 GHIS 1 • {	1973 POLES-2/3014, 44 JFT4, 1035 CHHS • {	1973 POLES-2/3+14, th PFT-, 1035 GHS • (4,737163 • 54,3873 •	Y LOSSES	RINGRY LINE LOSSES + ON-PEOK PRIN LI) . 10656	RIMMY LINE LOSSES + OFF-PEAK PRIM LI 2754	WY AND SECONDARY LOSSES	DANY LINE LOSSES + DN-PEAK SECCHONAY 168	The state of the s
AND COMMENT OF THE PROPERTY OF	.TA 104 69/13.8 NV DE.TR		CALCLATIONS	PS = \$ LDDD ON PERNANE LDDD FACTOR*21*E-MILES-CONDUCTORS-GNES PERN FT-65,29 NFT PER NILE = NRS IN PERIOD 230 = 0,19 1/2 + 477,05 = 2 + 0,1635 = 5,26 = 6760 = 6760 = 550 NR	UNDS + \$ LOND ON PEXNON-PEXX LOND FACTORY2)*2-WILLESHCONDLICTORS-GANG PER N FT-5, 28 NFT PER NILE + HAS 2.30 + 0.27 1/2 + 477.05 + 2 + 0.16.35 + 5,28 + 3750 11559 NAH	MPS + \$ LODD ON PERWOTF-PERK LODD FROTON-2)-2-MILED-ACOMOUTING-ADMB PER M FT-65.20 NFT PER MILE + 1455 IN PERIOD 5.200 + 0.12)-2 + 477.05 + 2 + 0.16.35 + 3.20 + 5.00 + 5010 - 10.597 + 5010 +	NACTOR + SAPS)-2-CHAB PER NET-AUSTONENS-BONDP FT-AUXOLUTIONS-AR IN PER 28 + 6) 2 + 6 0 + 1	** (LDA) FACTOR ** RAPS)*2**CAND PER NETACUSTONENS-GAND? FT-ACROLLETONS-ARE IN PER ** (L. 81.3622 ** 6.) ^ 2 * 0.4157 ** 80 * ** (L. 83550 ** 3750 ** 3750 ** 144 WAH	= (LONG FACTOR + ANDS)-2+CHAS PER IFT+CUSTONENS-DADP FT+CONCULTIONS+IR IN PER =(0.335289 + 6)^2 + 0.4157 + 80 + . = 0.016322 + 5010 - 2 +	2 \$9946, 2 CLETONELDS BECH LITH 724 COLINC. *COLINC. FRCTON*LDS FRCTON?*C+1986 POLES, 9 *0.65626) * 2 * 15007 / 14464 *2 // 8 MAH	2 97465, 2 CLSTDGES BICH IN 724 C.F. ROTHEL FRETCH LOB FRETCH / 2-1346 PG ES/ 3 -0.81352) - 2 + 1347 / 1446 + 2 /3 1 Mei	2 9046, 2 DISTURENS BOOK NITH TSK C.F. COUNC. FACTON-LODD FACTON-2-1366 POLES/ 1 00.535289) ~ 2 = 15637 / 14464 - 8 /3 1 464 - 5010	LINE LOSSES / TOTAL PRINGRY AND SECONDARY LOSSES } / 13002 = 0,979	= AME ADJ PRIMARY LINE LIGSES FIRM SCH 2A / AME PRIMARY LINE LIGSES + ON-FEAK PRIM LINE = 12459 / 13524 + 11569 =	PRINGRY LINE LESSES FROM SCH 26 / AVE P	SECTIODARY LICSS FACTOR = SECTIODARY SERVICES RAD WRING LOSSES / 10TAL PRIMARY AND SECTIODARY LISSES RAC RAG.	SECONDARY LOSSES FINI SCH 2A / AME SECONDARY LINE LOSSES + DH-PEAK SECONDARY LOSSES 5 / 277 + 112 =	ECTATION (DOCCO COM CO. 20 J. ALF. CCD.
MESTINGLOUSE LISS MATINGS; CURE 0, CO2 HAL/ANA CUIT. 0, CO5 HAL/ANA I. SLBTRANSHISSION VALTHEE LEVEL;	FLAGE POW LISYLL & KV DELTA REEDH ST 89/13, & KV DELTA SLAMER ST 69/13, & KV DELTA GENERHIOR & ELETRIC STATION 69/13, & KV DELTA	TOTAL SUBTRONENESSION LENDING	II. PRIMAY & SECREDAY LINE LOSS CALCALATIONS	PRIMORY LINE LIBS = (800-8) AMERICA = (80-8) AMERICA = (8	PRIMARY LINE LOSS = 48405 CN-PEST = 25 E 3.00 E 3.00	PRIMARY LINE LOSS = 10402-20 LOFF-DEM = 0.59 = 0.59	SECONOMY SERVICES = (LIND FACTUR + F FAE LINSES = (0, 656,928 + 6) = 0, 025,037 + 6) = 220 MM	SECTIONARY SERVICES = (1,000 F) ON-PER (19355 = (1,61,52)	7 (100) 100 10	SECONDARY WINS RAFE LISSES RA	SECONORIA WAINS ASSUME &	SECRADARY MATINS ASSUME & COMPSON CONFIDENCES = (2040) CONFIDENCES = 0.004425 = 22	PRINGAY LOSS FACTOR = PRINGAY LINE PAE = 13524 /	ADJUSTED CH-PEAK PRIMARY LOSS = AME ADJ I	ADJUSTED OFF-PERK PRIMARY LISSS = AFE ADJ PRIMARY LINE LISSES FROM SCH 2A / AKE PRIMARY LINE LISSES + OFF-PERK PRIM LINE LISSES 27754 = 12459 / 13524 + 2845 = 27754	SECONDARY LOSS FACTOR = SECONDAR	# Ex	ADJUSTED OFF-PECK SETTIMORY 1785 = DUF ON 1

ADJUSTED OFF-PEAK SCONDARY LOSS = AVE ADJ SECONDARY LOSSES FINN SCH 24 / AVE SECONDARY LINE LOSSES + OFF-PEAK SECONDARY LOSSES

Marginal Loss Study

FITCHBURG MARGINAL LOSS STUDY SCHEDULE 1A SUMMARY OF MAH LOSSES

		LINE	CORE	COIL	TOTAL MAH	CUN MARGINAL MAH	CLIM AVERAGE MAH	MARGINAL & DIFFERENCE
	TRANSMISSION	1,219		-	1,219	1,219	1,155	A 736
	SUBTRANSMISSION	343	894	527	1,763	2,982	·	0.736
	PRIMARY	12,917	1,288	824	15,028	18,010	2, 875 17, 399	1.224 6.981
	SECONDARY	274	5, 935	818	7,027	25, 038	24, 363	7.704
II.	ON PEAK LOAD LEVEL (73.7 MH)							
	The state of the s	LINE	CORE	COIL	TOTAL MAH	CLM MARSINAL MAH	CUM AVERAGE MIH	MARGINAL % DIFFERENCE
·	TRANSMISSION	LINE 677			MAI	MARGINAL MAH	AVERAGE Mult	DIFFERENCE
			CORE		677	MARGINAL MAH 677	AVERAGE HAH 612	DIFFERENCE
,	TRANSMISSION	677			677 902	677 1,579	612 1,476	1.741 2.745
•	TRANSMISSION SUBTRANSMISSION	677 190	383	329	677	MARGINAL MAH 677	AVERAGE HAH 612	DIFFERENCE
-	TRANSMISSION SUBTRANSMISSION PRIMARY	677 190 10,048	383 551	329 514	677 902 11,114	677 1,579 12,693	612 1,476 12,210	1.741 2.745 12.870

	LINE	CORE	COIL	TOTAL MAI	CUM MARGINAL MAH	CLIM AVERAGE MAH	MARGINAL * DIFFERENCE

TRANSMISSION	542			542	542	542	0.003
SUBTRANSMISSION	152	511	198	861	1,403	1,399	0.085
PRIMARY	2,869	736	309	3, 915	5, 318	5, 130	2.552
SECONDARY	103	3, 395	307	3, 805	9, 122	8, 981	2.822

FITCHBURG MARGINAL LOSS STUDY SUMMARY OF MIL LOSSES ON PEAK

SCHEDULE 1B

I. AT PEAK LOAD LEVEL (73.7 MJ)

•	LINE	CORE	COIL	TOTAL MM	CUM MARGINAL MM	CUM AVERAGE MN	MARGINAL X DIFFERENCE
TRANSMISSION	0.3042			0.3042	0.3042	0.296	0.816
SUBTRANSMISSION	0.1030	0.1020	0.1355	0.3406	0.6448	0.6311	1.365
PRIMARY	7.2504	0.1470	0.2120	7.6094	8,2541	8.0217	23.244
SECONDARY	0.0734	0.6776	0.2106	0.9616	9.2157	8. 9771	23.860

I. TRANSMISSION

```
A. LINE LOSSES = PROFORMED LINE LOSSES FROM LOADFLOW * HOURS PER PERIOD = (89 PEAK / 81 OFF PEAK + ANNUAL LOAD FACTOR)^2 * OFF PEAK LINE LOSSES * HOURS PER PERIOD = 1.0570 * 0.1317 * 8760 = 0.1392 * 8760 = 1219 MHH
```

B. TRANSFORMER LOSSES

COIL = NONE

II. SUBTRANSMISSION

```
A. LINE LOSSES = PROFORMED LINE LOSSES FROM LOADFLOW # HOURS PER PERIOD = (89 PEAK/ 81 OFF PEAK + ANNUAL LOAD FACTOR)^2 # OFF PEAK LINE LOSSES # HOURS PER PERIOD = 1.0570 # 0.037 # 8750 = 0.0391 # 8760 = 343 MAH
```

B. TRANSFORMER LOSSES

```
CORE = NAMEPLATE RATING + WESTINGHOUSE LOSS FACTOR (MP-29) + HRS IN PERIOD = 51.000 + 0.002 + 8760 = 0.1020 + 8760 = 894 MMH
```

CDIL = (RATIO OF PEAK TO NAMEPLATE+LOAD FACTOR)^2 * NAMEPLATE RATING * LOSS FACTOR * HRS IN PERIOD = (33,943 / 51.000 *0.665964) ^2 * 51.000 * 0.006 * 8760 = 0.0601 * 8760 = 527 MAH

III. PRIMARY

B. TRANSFORMER LOSSES

```
CORE = NAMEPLATE RATING * MESTINGHOUSE LOSS FACTOR (MP-2B) * HRS IN PERIOD = 73.500 * 0.002 * 8760 = 0.1470 * 8760 = 1288 MMH
```

COIL = (RATIO OF PEAK TO NAMEPLATE*LOAD FACTOR)^2 * NAMEPLATE RATING * LOSS FACTOR * HRS IN PERIOD
= (50.957 / 73.500 *0.665964) ^2 * 73.500 * 0.006 * 8760
= 0.0940 * 8760
= 824 MMH

IV. SECONDARY

B. TRANSFORMER LOSSES

```
CORE = CORE LOSS IN MM FROM WORKPAPER 2B + HOURS IN PERIOD = 0.6776 + 8760 = 5935 MAH
```

COIL = (RATIO OF PRIMARY PEAK TO NAMEPLATE*LOAD FACTOR)^2 * NAMEPLATE RATING * LOSS FACTOR * HRS IN PERIOD = (50.957 / 148.917 *0.665964) ^2 * 148.917 *0.012079 * 8760 = 0.0934 * 8760 = 818 MMH

V. DERIVATION OF PRIMARY AND SECONDARY LINE LOSSES

```
TOTAL ANNUAL LOSSES= 25038 MAR
TOTAL IDENTIFIED = 11847 MAR

REMAINING LOSSES = 13191 MAR

PRIMARY LINE LOSSES = PRIMARY LOSS FACTOR FROM HORKPAPER 2C * REMAINING LOSSES = 0.9793 # 13191  
= 12317 MAR
```

SECONDARY LINE LOSSES = SECONDARY LOSS FACTOR FROM HORKPAPER 2C * REMAINING LOSSES = 0.0207 # 13191 = 274 MMH

PERIOD 3750

TRANSMISSION

A. LINE LOSSES = PROFORMED LINE LOSSES FROM LOADFLOW # HOURS PER PERIOD

(89 PERK/ 81 PERK * ON PERK LORD FACTOR)^2 * ON PEAK LINE LOSSES * HOURS PER PERIOD 0.7851 * 0.2565 * 3750 0.2014 * 3750 .

=

755 MH

B. TRANSFORMER LOSSES

CORE NONE

COIL = NONE

=

=

II. SUBTRANSMISSION

= PROFORMED LINE LOSSES FROM LOADFLOW # HOURS PER PERIOD A. LINE LOSSES

= (89 PEAK/ 81 ON PEAK + ON PEAK LOAD FACTOR)^2 + ON PEAK LINE LOSSES + HOURS PER PERIOD = 0.7851 + 0.0869 + 3750

0.0682 # 256 MM * 3750 *

B. TRANSFORMER LOSSES

CORE = NOVEPLATE RATING + MESTINGHOUSE LOSS FACTOR (MP-28) + HRS IN PERIOD

3750

51.000 # 0.002 #

0.1020 # 3750

383 MH

COIL

= (RATIO OF PK TO NAMEPLATE=ON PK LOAD FCTR)^2 + NAPLATE RATE + WEST LOSS FCTR + HRS IN PERIOD

33.943 / 51.000 *0.813692) ^2 # 51.000 # 0.006 # 0.006 # 3750

3750

337 MMH

III. PRIMARY

B. TRANSFORMER LOSSES

CORE = NAMEPLATE RATING + MESTINGHOUSE LOSS FACTOR (MP-28) + HRS IN PERIOD =

73.500 # 0.002 # 3750

0.1470 + 3750

2 551 MM

COIL = (RATIO OF PEAK TO NAMEPLATE+LOAD FACTOR)^2 + NAMEPLATE RATING + LOSS FACTOR + HRS IN PERIOD

50.957 / 73.500 ±0.813692) ^2 ± 73.500 ± 0.006 ± 3750

= 0.1403 # 3750

526 MM

IV. SECONDARY

B. TRANSFORMER LOSSES

CORE * CORE LOSS IN NW FROM WORKPAPER 28 * HOURS IN PERIOD 2

0.6776 + 3750

= 2541 MMH

= (RATIO OF PRIMARY PEAK TO NAMEPLATE*LOAD FACTOR)^2 * NAMEPLATE RATING * LOSS FACTOR * HRS IN PERIOD COIL

50.957 / 148.917 #0.813692) ^2 # 148.917 #0.012079 # =

0.1395 # 3750

효 523 MM

220

DERIVATION OF PRIMARY AND SECONDARY LINE LOSSES

PRIMARY LINE LOSSES = ADJUSTED PRIMARY ON-PEAK LOSS FROM HORKPAPER 2C

ON-PEAK = 11105 MAH

SECONDARY LINE LOSSES = ADJUSTED SECONDARY ON-PEAK LOSS FROM WORKPAPER 2C ON-PEAK 2 175 MH

HOURS IN

PERIOD 5010

TRANSMISSION

= PROFORMED LINE LOSSES FROM LOADFLOW * HOURS PER PERIOD A. LINE LOSSES = (89 OFF-PEAK PEAK/ 81 OFF-PEAK PEAK + OFF PEAK LOAD FACTOR)^2 * OFF PEAK LINE LOSSES * HOURS PER PERI = 0.8217 * 0.1317 * 5010

0.1082 # 5010 = 542 MAH

B. TRANSFORMER LOSSES

CORE NONE

COIL NONE æ

II. SUBTRANSMISSION

A. LINE LOSSES * PROFORMED LINE LOSSES FROM LOADFLOW * HOURS PER PERIOD

(89 OFF-PEAK PEAK/ 81 OFF-PEAK PEAK + OFF PEAK LOAD FACTOR)^2 + OFF PEAK LINE LOSSES + HOURS PER PERIO 0.8217 + 0.037 + 5010

0.8217 + 3 0.0304 # 5010

152 MH =

B. TRANSFORMER LOSSES

CORE * NOMEPLATE RATING * MESTINGHOUSE LOSS FACTOR(MP-28) * HRS IN PERIOD

= 51.000 # 0.002 # 5010 0.1020 # 5010 = 511 MH

COIL (RATIO OF PK TO NAMEPLATE=OFF PK LOAD FCTR)^2 * NMPLATE RATE * WEST LOSS FCTR * HRS IN PERIOD =

33.943 / 51.000 # 0.5396) ^2 # 51.000 # 0.006 # 0.0395 # 5010 5010

= 198 MH

III. PRIMARY

B. TRANSFORMER LOSSES

CORE = NAMEPLATE RATING + MESTINGHOUSE LOSS FACTOR (MP-28) + HRS IN PERIOD

E 73.500 # 0.002 # 5010 = 0.1470 # 5010

2 736 MAH

COIL (RATIO OF PEAK TO NAMEPLATE*LOAD FACTOR)^2 * NAMEPLATE RATING * LOSS FACTOR * HRS IN PERIOD

50.957 / 73.500 + 0.5396) ^2 + 73.500 + 0.006 + 0.0617 + 5010

. 5010

309 MMH

IV. SECONDARY

B. TRANSFORMER LOSSES

CORE = CORE LOSS IN MW FROM WORKPAPER 28 # HOURS IN PERIOD

z 0.6776 * 5010 3395 MAH =

(RATIO OF PRIMARY PEAK TO NAMEPLATE*LOAD FACTOR)^2 * NAMEPLATE RATING * LOSS FACTOR * HRS IN PERIOD COIL =

50.957 / 148.917 * 0.5396) ^2 * 148.917 *0.012079 * 5010 0.0613 * 5010

= 307 MAH

DERIVATION OF PRIMARY AND SECONDARY LINE LOSSES

= ADJUSTED PRIMARY OFF-PEAK LOSS FROM WORKPAPER 2C PRIMARY LINE LOSSES OFF-PEAK 2869 MMH

SECONDARY LINE LOSSES = ADJUSTED SECONDARY OFF-PEAK LOSS FROM WORKPAPER 2C OFF-PEAK 103 MH

TRANSMISSION

= PROFORMED LINE LOSSES FROM LOADFLOW + HOURS PER PERIOD A. LINE LOSSES = (89 PEAK/ 81 PEAK)^2 + ON PEAK LINE LOSSES

1.1858 + 0.2565 0.3042 MH

=

B. TRANSFORMER LOSSES

CORE NONE

COIL NONE =

=

II. SLETRANSMISSION

A. LINE LOSSES = PROFORMED LINE LOSSES FROM LOADFLOW + HOURS PER PERIOD

= (89 PEAK/ 81 PEAK)^2 + ON PEAK LINE LOSSES

1.1858 # 0.0869 0.1030 ## =

B. TRANSFORMER LOSSES

CORE = NAMEPLATE RATING * HESTINGHOUSE LOSS FACTOR (NP-28)

51.000 * 0.002

0.1020 MM

= (RATIO OF PK TO NAMEPLATE)^2 * NMPLATE RATE * WEST LOSS FCTR COIL

(33.943 / 51.000) ^2 ± 0.1355 MH 51.000 # 0.006

III. PRIMARY

B. TRANSFORMER LOSSES CORE

= NAMEPLATE RATING + WESTINGHOUSE LOSS FACTOR (MP-2B)

73.500 # 0.002

0.1470 MM =

COIL

= (RATIO OF PEAK TO NAMEPLATE)^2 + NAMEPLATE RATING + LOSS FACTOR = (50.957 / 73.500) ^2 + 73.500 + 0.006 = 0.2120 MM

IV. SECONDARY

B. TRANSFORMER LOSSES

CORE = CORE LOSS IN MW FROM WORKPAPER 28 * HOURS IN PERIOD

0.6776 MM ========

COIL

= (RATIO OF PRIMARY PEAK TO NAMEPLATE)^2 * NAMEPLATE RATING * LOSS FACTOR

50.957 / 148.917) ^2 * 148.917 * 0.012079

= 0.2106 MM

DERIVATION OF PRIMARY AND SECONDARY LINE LOSSES

PRIMARY LINE LOSS (AMPS * * LOAD ON PEAK)^2*MILES*CONDUCTORS*OHMS PER M FT*5, 28 MFT PER MILE =

ON-PEAK =(230 0.41)^2 + 477.05 * 2 * 0.1635 *

7.250 MH =

SECONDARY SERVICES = (AMPS)^2*OHMS PER MFT*CUSTOMERS*DROP FT*CONDUCTORS

ON-PEAK LOSSES =(6)^2 * 0.4157 # 80 . 24288 # 2

= 0.0582 MH

SECONDARY MAINS ON-PEAK LOSSES

ASSUME 2 SPANS, 2 CUSTOMERS EACH WITH 75% COINCIDENCE FAC = (2#AMPS#COINC, FACTOR)^2#1986 POLES/1973 POLES#2/3#14.44 MFT#.1035 OHMS PER MFT#19.724MFT # .1644 OHM PER =(9) ^ 2 # 15837 / 14464 #2 /3 #4.737165 # 54.3873

= 0.0152 MM

FITCHBURG LOSS STUDY LOAD AND LOAD FLOW DATA MARGINAL LOSSES

WORKPAPER 1

I. LOAD DATA

TEST YEAR PEAK LOAD (MM)	73.70
TEST YEAR MIN GENERATED AND PURCHASED	429, 955
TEST YEAR MIN ACCOUNTED FOR	404, 917
TEST YEAR UNACCOUNTED FOR MAN LOSSES	25,038
TEST YEAR LOAD FACTOR: ((GEN & PUR)/8760/PEAK L	66.60%
TEST YEAR AVERAGE PEAK (MM): ((GEN & PUR)/8760	49.08
TEST YEAR OFF PEAK LOAD (MM)	48.25
TEST YEAR OFF PEAK PERIOD LOAD FACTOR	81.30x
TEST YEAR ON PEAK PERIOD LOAD FACTOR	81.37%
test year off peak load factor with on peak pk	53.96≴
II. LOAD FLOW DATA	
TRANSMISSION SYSTEM LINE LOSS 67.68 NN PEAK	0.2565 MW
SUBTRANSMISSION SYSTEM LINE LOSS 67.68 NW PEAK	0.0869 MH
TRANSMISSION SYSTEM LINE LOSS 47.74 NN PERK	0.1317 MH
SUBTRONSMISSION SYSTEM LINE LOSS 47.74 MM PEAK	0.0370 MH

I. DERIVATION OF COINCIDENT LOADING FACTOR

PEAK (NN) 73.700 NVA 0 .95% POMER FACTOR 77.579

KNOWN COINCIDENT LORDS:

FLAGG POND #2 FDR

3.74 MM/.8 PF 4.68

TOTAL NHOWN 20.76

COINCIDENT LOAD NVA FOR THE REST OF THE SYSTEM #

	SUBSTATIONS:	NONCOINCIDENT HVA	COINCIDENT MVA (NONCOIN+, 9165)	NAMEPLATE NVA
-	P CANTON 4 KV P CANTON 13 KV P ELLIS ST P ELEC STATION 4 P LLIN 4 KV P NOCKEBE 4 KV * P PLEASANT 4 KV P PLEASANT 13 KV P RINDSE 4 KV P RIVER 13 KV P RIVER 13 KV P SOL FITCH 4KV * TOWNSEND 13 KV URLIAGE 4 KV W. FITCH W. TOWNSEND #39 FOR #38 FOR #40 FOR BEECH ST	2.544 2.736 2.184 4.800 4.080 2.995 0.996 6.144 1.152 8.550 1.411 6.432 1.930 0.922 3.328 5.200 2.860 2.400 2.500	2.679 2.881 2.300 5.055 4.296 3.154 1.049 6.470 1.213 9.003 1.486 6.773 2.032 0.971 3.504 5.476 3.012 2.527 2.633	2.500 10,000 2.500 3.750 5.000 2.500 10.000 1.500 7.500 3.000 1.500 3.750 7.500
	NON COINCIDENT LOAD (* INCLUDED ELSENHERE)	63.164 MVA 53.958 MVA	66.513 MVA 56.819 MVA	
TOTAL	PRIMARY LOAD (P)	50.957 MVA		73.500 NVA

COINCIDENT LOADING FACTOR = COINCIDENT LOAD OF REST OF THE SYSTEM / NONCOINCIDENT LOAD = 56.819 / 53.958 = 1.0530

KV9 1.5 2.5 3 7.5 7.5 9 10 15 25 30 37.5 45 75 100 112	977 26 16 505 2 14 1216 806 1400 51 191 47 229 81 53	2.5 46 5 2525 12160 12160 12120 35000 1530 7162.5 2115 11450 6075 5300					COIL LOSS 10-45 KVA: 72846 /	148917 # 0.0148 KW/KVA	≖ 0.007239 KW/KWA
_	4655	97127	KVA	# 0.00537 KI	W/KVA =	521.57			
150 150 167 200 225 250 300 333 500 750	18 6 13 3 4 4 33 33 21	2171 600 900 1000					COIL LOSS 50-500 KVA: 53951 /	148917 # 0.0103 KW/KWR	= 0.003731 KW/KWA
	109	32670	KVA	+ 0.00317 KM	W/KVA =	103.56			
1000 1500 2500	3 1 1	3000 1500 2500	_						
	5	7000		- # 0.002 KM	4/KVA =	14.00			
GRAND TOTAL	4769	136797	KVA				COIL LOSS 750 + KVA		
CUSTONER OWNED SECONDARY NETERED		12120		# 0.00317 KW	i/kva = ===	38.42	22120 /	148917 # 0.00746 KW/KVA	= 0.001108 KW/KVA
		148917	KVA	TOTAL CORE L	.0SS =	677.56		COMPOSITE COIL LOSS	= 0.012079 KW/KVA

	CHICLERED IN LOSS STUDY) COMMILL, WILL, RINEE, N. FITCHO (H.M., 5.55, 840 First)		CONCITUOSACIONES PER IN FIFE, 20 NFT PER MILE + NAS IN PERIOD C. 1615 + 15, 25 + 1760	\$ LOND ON PERKON-FOX LOND FACTOR-27-2-VILLER-CONDUCTORS-QUAR PER IN FIRS, 26 NFT PER NILE + INS 10 PERIOR + 0.27)-2 + 477.05 + 2 + 0.1635 + 5.28 + 3750 + 3750 NAI	S LOVO ON PERKADY-PERK LOVO FACTOR-2)-Zehiles-combines-combines of the last kill of the line of the last combines	SHIR LIN PER SHEO	A-48 1/4 PEX N-284 + 2 + 3750	NEW TAPER	8998, 2 OJSTORENS EKKN WITH TAS KONKLIBENZE FACTOR KONDINC, FRCTORELOND FACTORIN-20196 POLESZ/1973 POLESZ/2014, 44 WITH, 1035 GHB PER PF19, 724MF1 + ,1644 GHB PER PF1 + 8CMLE FACTOR + HR IN PER + 6, 65254 } * 2 + 13637 / 14464 ML /3 +4,727165 + 54,3873 * + 8769 • 8760 • MRH	1, 44 NFT4, 1035 DINS PER NFT+19, 724NFT 0 , 1644 DIN PER NFT + 909LE FACTOR + HR IN PER 1873 • 1750	SPONS, 2 CLSTONERS BACK WITH TAX C.F. COUNC. FACTON-CADD FACTOR-2-1966 POLES/1973 POLES/2/2-14, 44 NFTs, 10.35 DANS PER NFT+19. 724NFT 0., 1644 DAN PER NFT 0 SEXIE FACTOR 0 HR IN PER 0. SSSER) 2 0 158.77 / 1464 02 /3 04, 737165 0 54, 2873 0 5010 - SOLO NAM.		11105 PRIVING LINE LOSSES + ON-PEAK PHIM LINE LOSSES	ANE PRINCHY LINE LOSSES & OFF-PERK PRIN LINE LOSSES	7 LOSSES
BATTURE AT PERK LORE		32,943 MM	III E8-COMUCTORS-0 2 * 0, 1635 +)-Zeviiledecombucto ? * (L. 1635 *	y Zemileschouch ? •	BROP FT-CORDUCTOR	PEN NETACUSTURENSABATOP FRACTORCULETURSAMA 1N PEN 0.4157 + 80 + 24284 +	PER NET ACUSTOMERS-BAND FT ACCOUNTIONS HAT IN PER 0.4157 + 80 + 24286 +	IDENCE FACTOR 1/1973 POLES#2/3+1 3 +4.737165 + 54.	//973 POLES42/34/ 3 44. 737/65 + 54.	//973 POLES42/3+ - 3 44, 737165 + 54,	ESSEST AN	PRINARY LINE LOSS	PRIMARY LINE LOSSE	HARY AND SECTIONAL
HOGELATE ARTING MA	• 33 38 300 30 300 30 30 30 30 30 30 30 30 30 30 30 30 30 3	51.000 MM	1080 FRETURY2)*24 477.05 * 1	477.65 • 8	SIX LOS FACTORYS 477, 05 • 2	ER NFT-CJBTDEDB- 0,4157 •	ER NET-CUSTOMENS» 0.4157 •	ER MET «CUSTOMERS» C. 4157 •	CH MITH 726 COINC 1700: 201966 POLES 1507 / 1466 AP /	ICH WITH TOS C.F. 1700 '20196 PRES 1517 / 1464 42 /	CH MITH TOK C.F. JOOD "201966 POLES 3637 / 1445 42 /	SHORY AND SECONDA	PH SCH 28 / AME	945 / 52 KG 18	DBBES / TOTAL PALL
HESTINGHOUSE LOSS MATINGS: CORE C. COC PALYNA COIL C. COS MALMAR I. SUSTINGHICH SECTOR VOLTIME LEVEL:	RAGG POID 115/13.6 KV NELTR BEEN ST 69/13.6 KV NELTR SLIDER ST 69/13.6 KV NELTR GDERNTOR DE ELECTRIC STRITOR 69/13.0 KV NELTR	TOTAL SUSTINGUISION LORDING 11. PRIMARY & SECONDARY LINE LOSS DALCALATIONS	PRINGRY LINE LOSS = (1809) + 5 LOSO ON PERKANNE LOSO FRETORYZ)-Z-WILLES-CON PREKREE = (230 + 0,19)-2 + 477,05 + 2 + 0, = 1,535 + 6760	PRINNRY LINE LOSS = (19995 + \$ LONG ON PERKADI-PE ON-PERK = 200 + 0.27)*2 + 1.065 + 3750 = 11569 NAM	PRINGRY LINE LOSS = (800S + 5 LOSD ON FERRENTF-F- GF-FERR = 230 + 0,12 1-72 + C,537 + 5010 = 2309 MRH	SECONDANY SERVICES = (LOND FALTOR + ANDS)*2*COMB PER NET*CLERTONER&ANDY FT*CLOSSES = (LOSSES + 6.5 * 2 + 0.4157 + 80 + 24286 +	SECONARY SERVICES = (LDVO FACTOR + APPS)-Pactors FR (LDSSES = 16, 61,5620 + 5 + 5 + 2 + 6, 61,5620 + 5,750 + 2750 + 3750 + 10,000	SECONDARY SERVICES = (LOND FACTUR + GNDS)-2-GNNS PE OFF-PERK LOSSES +(0, 535505 + 6) ^ 2 + = 0, 016322 + 5010 = 65 MM	SECONDARY WINS RESIDE 2 STANS, 2 CLETONERS EA (2 NO. SECONDARY, PRETIDINGLISH PRET = 0.00575, 4 ST60 = 0.00575, 4 ST60	SECUNDARY NATION ACRUSE & STATES & C.	SECONDARY MINS ASSURE 2 SPONS, 2 CUSTONERS EN CF-PCAK LOSSES = (2-MPS-KDINK, FACTON-LOSD FRC = (0.004.35 = 5010 = 0.004.35 = 5010 = 2. NA4	PRINGRY LOSS FACTOR = PRINGRY LINE LOSSES / TOTAL PRINGRY AND SECONDARY ANE = 13458 / 13743 = 0.5773	(80,0,5TED ON-PERK PRINCHY LOSS = AME ROJ PRINCHY LINE LOSSES FRON SCH 26 / 13456 + 11569 + 1	ADJUSTED OFF-PEAK PRIMARY LOSS = ARE ADJUSTARY LINE LOSSES PROM SCY 24 PA	SECTIONARY LOSS FACTOR = SECTIONARY SERVICES AND MAINS LIGHER / TOTAL PALIMARY AND SECTIONARY LIGHES AND MAINS LOSSES

ADJUSTED ON-PERK SECONDARY LOSS = AVE NOJ SECONDARY LOSSES FIND SCH 28 / AVE SECONDARY LINE LOSSES + ON-PERK SECONDARY LOSSES - 175

PLISTE OF FEE STRINGS INC. - BE AN SENIMAN I POSE SHE MI IN I ME FENEMAN I IS INC.